Remarks/Arguments:

I. Status of the Application

Claims 6-11, 13 and 21-26 are pending in this application. In the September 14, 2006 office action, the Examiner:

A. Rejected claim 13 under 35 U.S.C. § 103(a), as allegedly being obvious over U.S. Patent No. 5,934,980 to Koos et al. (hereinafter "Koos") in view of U.S. Patent No. 6,436,830 to Merchant et al. (hereinafter "Merchant");

B. Rejected claim 6 under 35 U.S.C. § 103(a), as allegedly being obvious over Koos in view of Merchant;

C. Rejected claims 21-24 under 35 U.S.C. § 103(a) as allegedly being obvious over Koos in view of U.S. Patent No. 6,126,514 to Muroyama et al. (hereinafter "Muroyama") in further view of U.S. Patent No. 5,985,045 to Kobayashi (hereinafter "Kobayashi");

D. Rejected claims 25 and 26 under 35 U.S.C. § 103(a) as allegedly being obvious over Koos in view of U.S. Patent No. 5,733,177 to Tsuchiya et al. (hereinafter "Tsuchiya");

E. Rejected claim 7 under 35 U.S.C. § 103(a) as allegedly being obvious over Koos in view of Tsuchiya in further view of Merchant;

F. Rejected claim 8 under 35 U.S.C. § 103(a) as allegedly being obvious over Koos in view of Tsuchiya in further view of U.S. Patent No. 5,780,358 to Zhou (hereinafter "Zhou");

G. Deemed claims 9, 10 and 11 as allegedly being dependent upon a rejected base claim but allowable if rewritten in independent format.

In this response, Applicants respectfully traverse the prior art rejections of the claims and respectfully request reconsideration in view of the following remarks.

II. Claim 13 is in a Condition for Allowance

The Examiner has maintained the rejection of claim 13 as allegedly being obvious over Koos in view of Merchant. As discussed in the Response to Office Action dated June 12, 2006, it is respectfully submitted that the rejection of claim 13 is in error.

In particular, there is no motivation or suggestion to combine the teachings of Koos and Merchant in the manner proposed by the Examiner. Even if the teachings of Koos and Merchant were combined, they would be combined in a manner that does not arrive at the invention.

A. Koos

Koos teaches a multiple step CMP process. In one step, a first slurry is used for a CMP polishing step. (See Koos at Fig. 3, step 42). Thereafter, the polishing pad is rinsed using a first and a second diluting solution. The first diluting solution is an acidic buffer solution used to wash away particulate material and slurry. The second diluting solution includes a solvent comprising alcohol or acetone, and is used to wash away the first diluting solution. (See *id.* at Fig. 3, step 44, and col. 8, lines 2-14). The result is that the pH is carefully controlled in the process.

B. Merchant

Merchant teaches a CMP system that is especially designed for re-use of a slurry that is contaminated by metal particles. (See Merchant at Abstract). The CMP system includes a slurry processor that is designed to work with a special slurry that is made of up two emulsions. (*Id.* at col. 4, line 56 to col. 5, line 47). The first emulsion includes abrasive polishing particles and the second emulsion made up of an organic phase and an dispersed aqueous phase. The organic phase may include alcohol and allegedly an amine in the form of dipyridine. The two emulsions are used as the slurry simultaneously. (*Id.* at col. 3, lines 48-60; col. 5, lines 4-18; and Fig. 1).

In operation, the two-emulsion slurry is provided to the wafer during polishing. (See *id.* at Figs. 3 and 4). The polishing particles within the slurry remove surface irregularities including metal particles. The organic phase (i.e. amine) bonds with the metal particles to help carry the metal particles from the surface of the wafer. The used slurry is then removed from the wafer and placed into a slurry processor. (*Id.*) The slurry processor has stages the remove different phases of the slurry, including the organic phase and the continuous aqueous phase, and then final to remove the dispersed aqueous phase from the metal particles. (*Id.*) The removed ingredients (except for the metal particles) are re-emulsified and recombined and then re-used. (*Id.*)

C. There is No Motivation or Suggestion to Combine

There is no motivation or suggestion to combine Koos and Merchant, as proposed by the Examiner. In particular, the Examiner appears to propose modification of the slurry of Koos to include an amine for the purpose of capturing metal particles polished

from the semiconductor wafer. (See September 14, 2006 office action at p.5). However, there is no teaching in Merchant that reasonably conveys that it is useful to add an amine to *any* slurry in order to capture metal particles polished from the semiconductor wafer.

In particular, Merchant teaches the use of an amine to capture metal particles in a specific slurry composition that is configured *to allow re-use of the slurry.* (See generally Merchant at Figs. 3 and 4, and at cols. 4 and 5). The process taught by Merchant is specific to a particular process, and indeed requires a special slurry having the two emulsions. (See *id.* at col. 3 lines 48-60). This special formulation allows for the metal particles to be removed without losing the slurry. (See *id.* at Abstract).

There is nothing to indicate that, as a general principle, addition of an amine solvent to *any* aqueous slurry provides the intended result of allowing the separation of metal particles from the slurry. Merchant instead appears to require that the organic phase (amine) to be used in an emulsion that includes a dispersed aqueous phase, in conjunction with a slurry having particles and a continuous aqueous phase. Koos, however, does not appear to employ a slurry that includes both a continuous aqueous phase and a dispersed aqueous phase. Thus, nothing of Merchant suggests the use of an amine in the slurry of Koos.

Moreover, even if an amine *could* successfully operate to capture metal particles without being in a dispersed aqueous phase emulsion, there is no motivation to use an amine for that purpose in the system of Koos. As discussed above, the purpose of the amine (organic phase) and dispersed aqueous phase emulsion of Merchant is to capture metal particles in such a way that *allows for their separation from the used slurry.* (See Merchant at Abstract). Koos does not teach the re-use of slurry. In fact, Koos teaches

the use of a diluting material to wash the slurry away. The slurry that is washed away includes the metal particles removed during polishing.

As a consequence, there is no need for an amine to separate the metal particles from the slurry of Koos because there is no re-use of the slurry in Koos. Indeed, the use of the diluting solutions of Koos presumably leaves the used slurry completely unusuable due to its significantly weakened concentration.

Thus, for multiple reasons, there is no motivation or suggestion to add an amine, as taught by Merchant, to the polishing slurry of Koos. The amine used in Merchant is an indivisible piece of a complex system of emulsions and de-emulsifier/emulsifying processes that enable re-use of slurry that contains metal particles. Koos teaches a system that does not employ re-use of slurry, and indeed relies on washing away used slurry with diluting solution that would render the slurry un-reusable.

For all the foregoing reasons, there is no legally sufficient motivation or suggestion to combine Merchant and Koos as proposed by the Examiner, and certainly not in a manner that would arrive at the invention. As a consequence, it is respectfully submitted that the rejection of claim 13 is in error and should be withdrawn.

III. Claim 21 is Allowable Over the Prior Art.

The Examiner has rejected claim 21 as allegedly being obvious over Koos, Muroyama and Kobayashi. It is respectfully submitted that the Examiner has failed to make out a prima facie case of obviousness with respect to claim 21. In particular, it appears that the Examiner has alleged that Koos teaches all of the elements of claim 21 except for step d). (September 14, 2006 office action at p.7). To this end, the Examiner

states that: "Koos differs in failing to disclose (d) mixing said aqueous slurry containing an abrasive material and a nonaqueous solvent in a mixing unit so as to create a first volume of an aqueous slurry/nonaqueous solvent mixture ... prior to being disposed onto said semiconductor". (September 14, 2006 office action at p.7). The Examiner thereafter appears to allege that the prior art may be combined to arrive at the above-quoted mixing step.

The above-quoted mixing step differs from Step d), however. Step d) recites "mixing said aqueous slurry containing an abrasive material and said nonaqueous solvent so as to create a second volume of an aqueous slurry/nonaqueous solvent mixture having a greater weight % of said nonaqueous solvent than said first weight % prior to being disposed onto said semiconductor wafer". The Examiner does not allege that any of the prior art, alone or in combination, teach or suggest this step.

Accordingly, because the Examiner has not alleged that any of the cited art teaches or suggests step d) of claim 21, it is respectfully submitted that the rejection of claim 21 is in error and should be withdrawn.

Moreover, there is no motivation or suggestion to combine Koos, Muroyama and Kobayashi. As best understood, it appears that the Examiner alleges that one would modify Koos to pre-mix the slurry and diluting solution of Koos in the manner taught by Muroyama. The Examiner also appear to propose that Kobayashi teaches that one would pre-mix those materials in an in-line mixing container. (See *id.* at p.8). However, none of the prior art teach pre-mixing the slurry and diluting solution at one concentration

level, and then mixing the slurry and diluting solution at a different concentration level at another time. There certainly is no motivation or suggestion to modify Koos to perform such operations.

Thus, there is no motivation or suggestion to modify Koos to perform steps a) and d) as proposed.

For at least this additional reason, it is respectfully submitted that the obvious rejection of claim 21 is in error and should be withdrawn.

IV. Claims 22-24

Claims 22-24 depend from claim 21 and are allowable for at least the same reasons.

V. Claim 6

Claim 6 stands rejected as allegedly being obvious over Koos in view of Merchant as applied to claim 13. Claim 6 depends from and incorporates all of the limitations of claim 23, which depends from and incorporates all of the limitations of claim 21.

It is respectfully submitted that claim 6, which incorporates the limitations of claims 21 and 23, includes several limitations not found in claim 13. These limitations include step a) of claim 21. Step a) of claim 21 is not taught or suggested by Koos or Merchant. For at least this reason, it is respectfully submitted that the rejection of claim 6 over Koos and Merchant is in error and should be withdrawn.

VI. Claim 25

Independent claim 25 stands rejected as allegedly being obvious over Koos in view of Tsuchiya. The Examiner's rejection does not constitute a prima facie case of obviousness. The entire rejection is set forth below:

> Koos differs in failing to teach reducing the pressure of said polishing pad, respectively on said semiconductor wafer and said front side of semiconductor wafer prior to completing disposing a volume of nonaqueous liquid including a nonaqueous solvent onto said semiconductor safer, **in claims 25 and 26**.
>
> Tsuchiya teaches, "the applied pressure between the polishing pad an dthe wafer is simultaneously quickly decreased to reduce mechanical abrasion effets" (claim 8).
>
> Tsuchiya illustrates reducing the pressure of a polishing pad on a semiconductor wafer is known. Hence, it would have been obvious . . . to modify Koos by using Tsuchiya's method of reducing the pressure of a polishing pad on a semiconductor wafer for the purpose of reducing abrasion effects (Tsuchiya, claim 8).

(September 14, 2006 office action at p.9).

Even if all of the foregoing were true, the resultant method would not result in reducing the pressure "prior to completing disposing a volume of nonaqueous liquid including a nonaqueous solvent onto said semiconductor wafer". Indeed, the Examiner does not allege that Tsuchiya teaches any timing on reducing the pressure, much less the timing specified in the claims.

Further to this point, Tsuchiya does not suggest reducing the pressure in a manner that would arrive at claim 25. In particular, Tsuchiya teaches reducing the polishing pressure in the third step of a three-step polishing process that uses two or three different slurries. (Tsuchiya at col. 2, lines 40-63). Nevertheless, the Examiner has applied the *first* polishing step 42 of the multiple-step polishing process of Koos against the present invention. (See, e.g., rejection of claim 13). Tsuchiya does not suggest changing the polishing pressure during the first step of a multiple step polishing process. (See Tsuchiya at col. 2, lines 40-63 and Fig. 4). Accordingly, there is no motivation or

suggestion to modify Koos as proposed, nor is there a motivation or suggestion to modify Koos to include the pressure reducing step prior to completing disposing the volume of nonaqueous liquid on the wafer as claimed.

For at least these reasons, it is respectfully submitted that the obviousness rejection of claim 25 is in error and should be withdrawn.

VII. Claim 26

Claim 26 depends from claim 13. Claim 13 is in a condition for allowance as discussed above. Accordingly, claim 26 is in a condition for allowance.
Claim 26 is also allowable for the reasons set forth above in connection with claim 25.

VIII. Claims 7-11

Claims 7-11 depend from claim 25, which is in a condition for allowance. As a consequence, claims 7-11 are also in a condition for allowance.

IX. Conclusion

For the foregoing reasons, it is respectfully submitted that applicants have made a patentable contribution to the art. Applicant respectfully requests entry of the amendment and favorable consideration of the application.

Respectfully Submitted,

January 16, 2007

Harold C. Moore
Attorney for Applicant
Attorney Registration No. 37,892

Maginot, Moore & Beck
Bank One Center Tower
111 Monument Circle, Suite 3250
Indianapolis, IN 46204-5109
Telephone: (317) 638-2922